

PATENT SPECIFICATION

758,337



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COMPLETE SPECIFICATION.

Improvements in or relating to Helicopters.

We, PERCIVAL AIRCRAFT LIMITED, a British Company, of Luton Airport, Bedfordshire, LESLIE GEORGE FRISE, a British Subject, and JOHN WOTTON, a British Subject, both of the Company's address, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to helicopters capable of both hovering and forward flight and is particularly concerned with helicopters which are also capable of alighting on water.

The invention provides a helicopter capable of alighting on water and characterised by the provision of stub wings extending from the sides of the body and constructed to provide lift in forward flight and also to serve as, or carrying floats to serve as, stabilising sponsons.

It is preferred, in order that the helicopter may be amphibious, that the stub wings, or it may be the floats if provided, are provided with landing wheels which may, if desired, be retractable.

In one form of the invention the stub wings have landing wheels at the tips and are hinged about fore and aft axes at or near to the body and means (e.g. hydraulic rams and locking devices) are provided for supporting the wings in the normal attitude for flight, for swinging the wings downwardly by rotation about their hinges and for supporting the wings in the lowered position whereby the wings may be employed as a supporting undercarriage. One advantage of this arrangement is that the amount of negative lift due to the wings in hovering flight may be reduced by lowering of the wings.

The line of action of the total drag of a helicopter in forward flight normally is substantially below the rotor and accordingly causes the machine to tend to fly with a

nose-down attitude which becomes increasingly pronounced with increase in forward speed.

With a view to obviating or reducing the tendency to fly nose-down the centre of lift of the stub wings provided by the invention is preferably located in front of the rotor axis thereby to provide a force tending to lift the nose of the machine in opposition to the drag. To maintain stability a tail plane may also be provided and arranged to afford lift under all normal conditions of forward flight. The tail plane may be rotatable about a transverse axis to vary the lift and also to enable the whole of the tail plane surface to be brought to a nearly vertical position for the purpose of reducing the effect of the rotor downwash on the plane surface when the machine is hovering. Alternatively the lift may be modified by means of a small flap. In either case the control of the lift of the tail plane may be effected by the normal fore and aft flight control, trimming gear and/or an automatic stabilising device.

An example of an amphibious helicopter embodying some of the features of the invention and a modified form of the helicopter are shown in the drawings in this Specification in which:—

Figure 1 is a side view of the helicopter showing, in chain lines, the landing wheels in raised and lowered position;

Figure 2 is a front view showing, in chain lines, the wheels in lowered position; and

Figure 3 is a plan view of the modified form of the machine.

The helicopter shown in Figures 1 and 2 has a body 1 provided with stub wings 2 extending from the sides of the body. The body and wings are constructed for alighting on water and the wings have floats 3 at their tips.

Within the floats there are landing wheels 4. The wings are hinged to the body at 5

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and hydraulic rams (not shown) co-operating with suitable locking devices are provided for lowering the wings from the full line to the chain line position shown in Figure 2 and for holding the wings in that position so that the machine becomes suitable for alighting on land. It is to be noted that in forward flight the lift on the wings tends automatically to hold them in their upper flight position and moreover the lift may be used to assist in raising the wings to that position.

The centre of lift of the stub wings is in front of the axis of the rotor 6 and the machine has a tail plane 7 provided with elevators 8 (see Figure 3).

The machine as shown in Figures 1 and 2 has an access door 9. As, however, the machine does not require a tail rotor, in view of the stability provided by the stub wings and tail plane, it is convenient to hinge the tail end 10 of the body to the main body part about a vertical axis at one side as shown in Figure 3. With this modification the tail end may, as shown, be swung aside for access to the interior of the main part, e.g. for the entry of large or long loads such as stretchers.

The wings and/or floats may be constructed as fuel tanks and they may be readily removable to facilitate road or rail transportation of the machine.

The rotor may be driven by gaseous jets.

What we claim is:—

1. A helicopter capable of alighting on water and characterised by the provision of stub wings extending from the sides of the body and constructed to provide lift in forward flight and also to serve as, or carrying floats to serve as, stabilising sponsons.

2. A helicopter as claimed in Claim 1 in which the stub wings are provided with landing wheels.

3. A helicopter as claimed in Claim 1 or Claim 2 in which the stub wings are pro-

vided with floats at their tips and landing wheels on the floats.

4. A helicopter as claimed in any one of Claims 1—3 in which the stub wings have landing wheels at their tips and are hinged about fore and aft axes at or near to the body and in which means are provided for supporting the wings in the normal attitude for flight, for swinging the wings downwardly by rotation about their hinges and for supporting the wings in the lowered position whereby the wings may be employed as a supporting undercarriage.

5. A helicopter as claimed in any one of the preceding claims in which the stub wings are located with their centre of lift in front of the rotor axis.

6. A helicopter as claimed in Claim 5 and having a tail plane arranged to afford lift under all normal conditions of forward flight.

7. A helicopter as claimed in any one of the preceding claims and having a tail plane which is rotatable about a transverse axis to enable the whole of the tail plane surface to be brought to a nearly vertical position for the purpose of reducing the effect of the rotor downwash on the plane surface when the machine is hovering.

8. A helicopter as claimed in any one of the preceding claims in which the tail end of the body is hinged to the main body part about a vertical axis at one side so that the tail part may be swung aside for access to the interior of the main part.

9. An amphibious helicopter constructed and arranged substantially as herein described and shown in Figures 1 and 2 or in Figure 3 of the drawings.

BOULT, WADE & TENNANT,

111 & 112 Hatton Garden,

London, E.C.1.

Chartered Patent Agents.

PROVISIONAL SPECIFICATION.

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structed to provide lift in forward flight and also to serve as, or carrying floats to serve as, stabilising sponsons.

It is preferred, in order that the helicopter may be amphibious, that the stub wings, or it may be the floats if provided, are provided with landing wheels which may, if desired, be retractable.

In one form of the invention the stub wings have landing wheels at the tips and are hinged about fore and aft axes at or near to the body and means are provided for supporting the wings in the normal attitude for flight, for swinging the wings downwardly

5 by rotation about their hinges and for supporting the wings in the lowered position whereby the wings may be employed as a supporting under-carriage. One advantage is that the amount of negative lift due to the wings in hovering flight may be reduced by lowering of the wings.

10 The line of action of the total drag of a helicopter in forward flight normally is positioned substantially below the rotor and accordingly causes the machine to tend to fly with a nose-down attitude which becomes increasingly pronounced with increase in forward speed.

15 With a view to obviating or reducing the tendency to fly nose-down the centre of lift of the stub wings provided by the invention is preferably located in front of the rotor axis thereby to provide a force tending to lift the nose of the machine in operation to the drag. To maintain stability a tail plane may also be provided and arranged to afford lift under all normal conditions of forward flight. The tail plane may be rotatable
20 about a transverse axis to vary the lift and also to enable the whole of the tail plane surface to be brought to a nearly vertical

position for the purpose of reducing the effect of the rotor downwash on the plane surface when the machine is hovering. 30 Alternatively the lift may be modified by means of a small flap. In either case the control of the lift of the tail plane may be effected by the normal fore and aft flight contact, trimming gear and/or an automatic stabilising device. 35

With the above described arrangements it is unnecessary to provide a tail rotor and it becomes convenient to hinge the tail end of the body to the main body part about a vertical axis at one side so that the tail end may be swung aside for access to the interior of the main part, e.g. for the entry of large or long roads such as stretchers. 40

The wings and/or the floats may be constructed as fuel tanks and they may be readily removable to facilitate road or rail transportation of the machine. 45

The rotor may be driven by gaseous jets.

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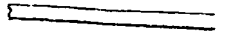
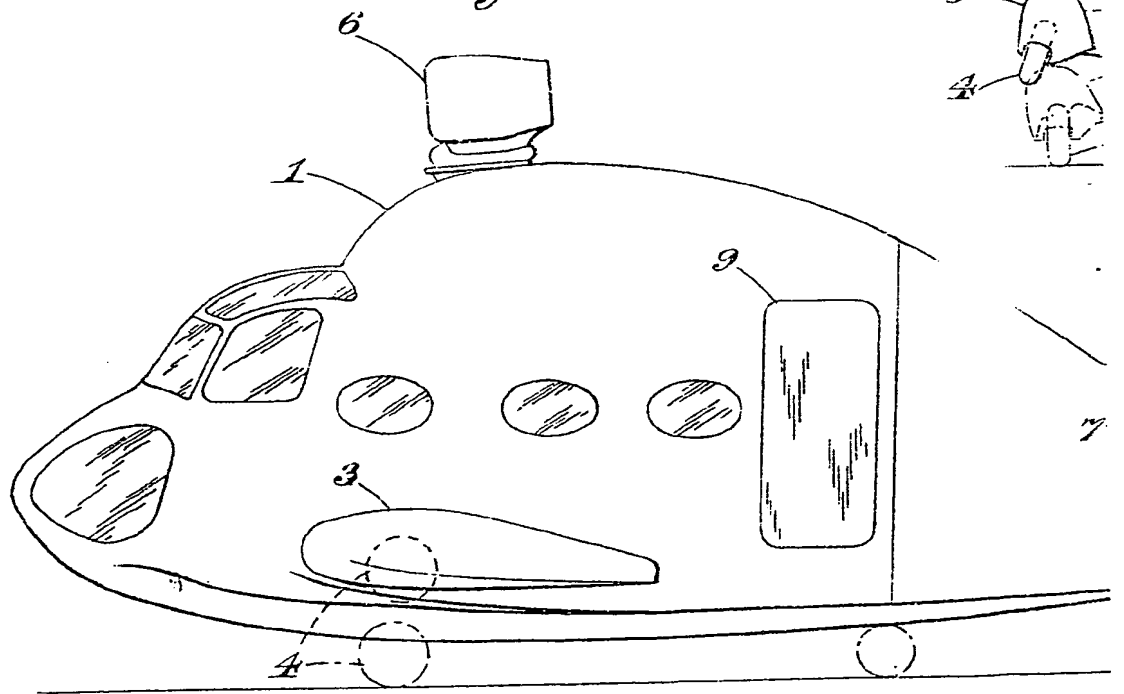


Fig.1.



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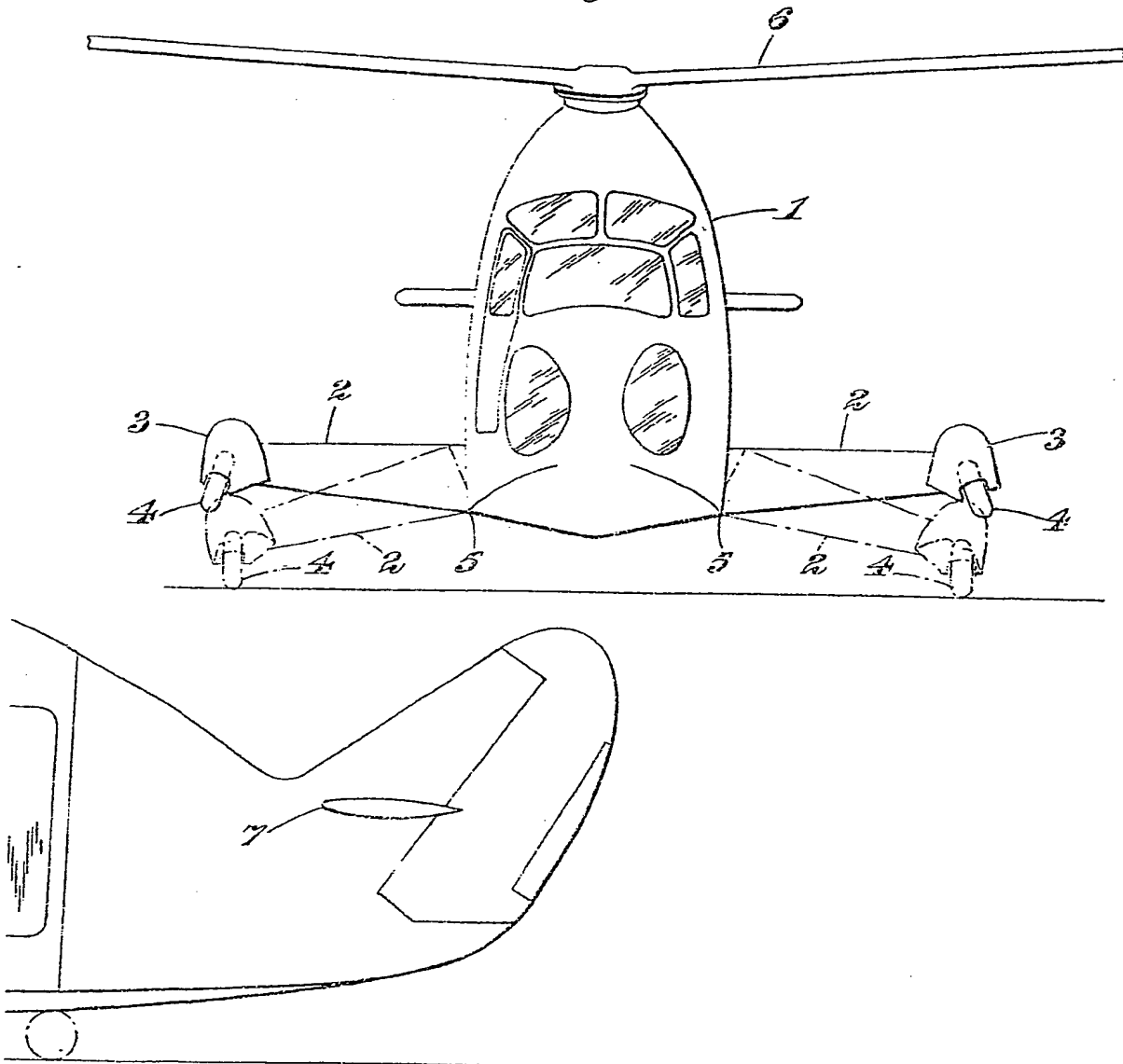
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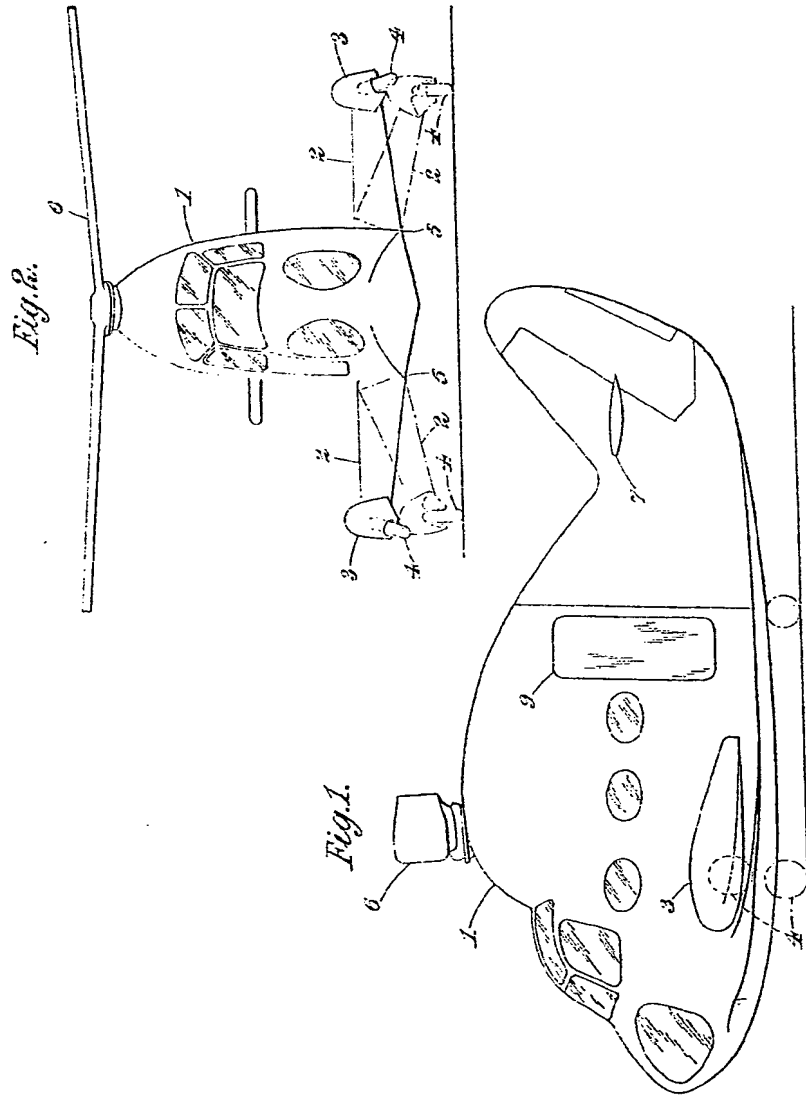
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SHEET 1

Fig. 2.





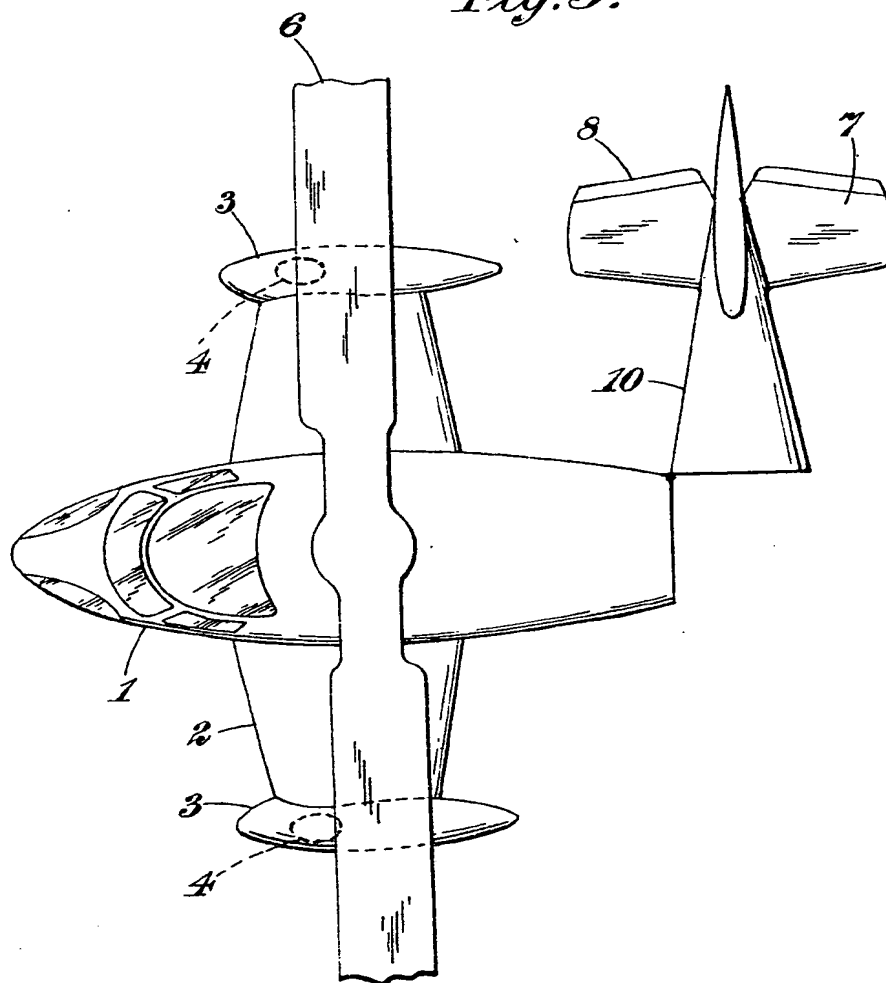
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SHEET 2

Fig. 3.



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